WE CLAIM:

1. A vector estimation system for processing a sequence of input vectors, said input vectors each comprising a plurality of element values, and said system comprising:

a digital filter with a filter vector input for receiving said sequence of input vectors and a predictor gain input for controlling characteristics of said filter, said digital filter also having both a current slowly evolving filter estimate output and a previous slowly evolving filter estimate output, said current slowly evolving filter estimate output providing a current filtered estimate vector of current filtered estimate element values of a slowly evolving component of said sequence of input vectors and said previous slowly evolving filter estimate output providing a previous filtered estimate vector of previous filtered estimate element values of said slowly evolving component of said sequence of input vectors; and

a parameter estimator having an estimator vector input for receiving said sequence of input vectors and a previous slowly evolving filter estimate input coupled to said previous slowly evolving filter estimate output, said parameter estimator further includes a predictor gain output coupled to said predictor gain input,

wherein when said vector estimation system receives a current input vector that is one of said sequence of said input vectors, said parameter estimator provides a current predictor gain vector of current predictor gain element values at said predictor gain input each of said current predictor

gain element values modifying one of said current filtered estimate element values at said current slowly evolving filter estimate output, each of said current predictor gain element values being dependent

5   upon both a said previous filtered estimate vector received at said slowly evolving filter estimate input and a said current input vector received at said estimator vector input.

10   2.   A vector estimation system as claimed in claim 1, wherein said parameter estimator is characterised by said current predictor gain element values being dependent upon both a sequence of previous input vectors and a sequence of said previous filtered estimate vectors.

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3.   A vector estimation system as claimed in claim 1, wherein said filter has a predictor error variance output and an observation noise variance input, said predictor error variance output providing a current predictor error

20   variance vector of current predictor error variance element values.

4.   A vector estimation system as claimed in claim 1, wherein when said vector estimation system receives said

25   current input vector, said parameter estimator provides a current observation noise variance vector of current observation noise variance element values at said observation noise variance output thereby modifying said current filtered estimate element values at said current

30   slowly evolving filter estimate output, said current observation noise variance element values being dependent upon a said previous filtered estimate vector received at said previous slowly evolving filter estimate input, said current input vector received at said estimator vector

input, a said current predictor gain vector and a said current predictor error variance vector.

5. A vector estimation system as claimed in claim 1, wherein the parameter estimator has an unvoiced speech module that determines the current input vector's harmonic energy content by assessing the current predictor gain element values and depending upon the current predictor gain element values the parameter estimator selectively sets the current observation noise variance values.

6. A vector estimation system for processing a sequence of input vectors, said input vectors each comprising a plurality of element values, and said system comprising:

a digital filter with a filter vector input for receiving said sequence of input vectors and an observation noise variance input for controlling characteristics of said filter, said digital filter also having a current slowly evolving filter estimate output, a predictor error variance output and a previous slowly evolving filter estimate output, said current slowly evolving filter estimate output providing a current filtered estimate vector of current filtered estimate element values of a slowly evolving component of said sequence of input vectors, said predictor error variance output providing a current predictor error variance vector of current predictor error variance element values and said previous slowly evolving filter estimate output providing a previous filtered estimate vector of previous filtered estimate element values of said slowly evolving component of said sequence of input vectors; and

a parameter estimator having an estimator vector input for receiving said sequence of input vectors and a previous slowly evolving filter estimate input coupled to said previous slowly evolving filter estimate output, said parameter estimator further includes a observation noise variance output coupled to said observation noise variance input and a predictor error variance input coupled to said predictor error variance output,

wherein when said vector estimation system receives a current input vector that is one of said sequence of said input vectors, said parameter estimator provides a current observation noise variance vector of current observation noise variance element values at said observation noise variance input each of said current observation noise variance element values modifying one of said current filtered estimate element values at said current slowly evolving filter estimate output, each of said current observation noise variance element values being dependent upon said current input vector, said current predictor error variance vector and said previous filtered estimate vector.

7.   A vector estimation system as claimed in claim 6, wherein the parameter estimator has an unvoiced speech module that determines the current input vector's harmonic energy content by assessing the current predictor gain element values and depending upon the current predictor gain element values the parameter estimator selectively sets the current observation noise variance values.

8.   A vector estimation system as claimed in claim 6, wherein said digital filter further includes:

a slowly evolving predicted estimate output providing a current predicted estimate vector of current predicted estimate element values of said slowly evolving component of said sequence of input vectors.

9. A vector estimation system as claimed in claim 6, wherein there is a smoother module having inputs coupled respectively to at least two outputs of said digital filter.

10. A vector estimation system as claimed in claim 9, wherein said smoother module has five inputs coupled to respective outputs of said filter.

11. A vector estimation system as claimed in claim 10, wherein said smoother module has a smoothed estimate output providing a smoothed estimate value of a previous slowly evolving component.

12. A vector estimation system as claimed in claim 11, wherein said smoothed estimate output is coupled to a smoothed estimate input of said parameter estimator.

13. A method for processing a sequence of input vectors each comprising a plurality of elements, said vectors being applied to a vector estimation system having a parameter estimator coupled to a digital filter, said method comprising the steps of:

receiving said sequence of input vectors at inputs of said filter and said parameter estimator, said input vectors comprising a plurality of element values;

determining a current predictor gain vector of current predictor gain element values, each of said

current predictor gain element values being determined from said current input vector that is one of said sequence of said input vectors, said determining being effected by said parameter estimator; and

5   applying said current predictor gain element values to said digital filter to thereby modify a current filtered estimate vector of current filtered estimate element values provided at an output of said digital filter, each of said current predictor gain

10   element values being dependent upon a previous filtered estimate vector from said filter and said current input vector.

      14. A method for processing a sequence of input

15   vectors as claimed in claim 13, wherein said step of determining is further characterised by providing a current observation noise variance vector of current observation noise variance element values and a current predictor error variance vector of current predictor error variance element

20   values from said current input vector.

      15. A method for processing a sequence of input vectors as claimed in claim 13, wherein said step of applying is further characterised by said filter receiving

25   said current observation noise variance element values thereby modifying said current filtered estimate element values, each of said current observation noise variance element values being dependent upon dependent upon a said previous filtered estimate vector, said current input

30   vector, a said current predictor gain element vector and said current predictor error variance vector.

      16. A method for processing a sequence of input vectors each comprising a plurality of elements, said

vectors being applied to a vector estimation system having a parameter estimator coupled to a digital filter, said method comprising the steps of:

      receiving said sequence of input vectors at inputs of said filter and said parameter estimator, said input vectors comprising a plurality of element values;

      determining a current observation noise variance vector of current observation noise variance element values, each of said current observation noise variance element values being determined from said current input vector that is one of said sequence of said input vectors, said determining being effected by said parameter estimator; and

      applying said current observation noise variance element values to said digital filter to thereby modify a current filtered estimate vector of current filtered estimate values provided at an output of said digital filter, each of said current observation noise variance element values being dependent upon a said current input vector, a vector comprising current predictor error variance element values, and a vector of previous filtered estimate element values.

    17. An encoder for processing a speech signal, said encoder comprising:

      a signal normalization module for processing the speech signal to provide a sequence of input vectors each comprising a plurality of element values;

      a digital filter with a filter vector input coupled to an output of the signal normalization module for receiving said sequence of input vectors, the digital filter also having an observation noise variance input for controlling characteristics of said

filter, said digital filter also having a current slowly evolving filter estimate output, a predictor error variance output and a previous slowly evolving filter estimate output, said current slowly evolving filter estimate output providing a current filtered estimate vector of current filtered estimate element values of a slowly evolving component of said sequence of input vectors, said predictor error variance output providing a current predictor error variance vector of current predictor error variance element values and said previous slowly evolving filter estimate output providing a previous filtered estimate vector of previous filtered estimate element values of said slowly evolving component of said sequence of input vectors; and

a parameter estimator having an estimator vector input for receiving said sequence of input vectors and a previous slowly evolving filter estimate input coupled to said previous slowly evolving filter estimate output, said parameter estimator further includes a observation noise variance output coupled to said observation noise variance input and a predictor error variance input coupled to said predictor error variance output,

wherein when said vector estimation system receives a current input vector that is one of said sequence of said input vectors, said parameter estimator provides a current observation noise variance vector of current observation noise variance element values at said observation noise variance input each of said current observation noise variance element values modifying one of said current filtered estimate element values at said current slowly evolving filter estimate output, each of said current

observation noise variance element values being
dependent upon a said current input vector, said
current predictor error variance vector and said
previous filtered estimate vector.

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18. An encoder for processing a speech signal as
claimed in claim 17, wherein the encoder includes an adder
module with one input coupled to said slowly evolving
filter estimate output and another input coupled to the
10 output of the signal normalization module, wherein in use
said adder subtracts the said current filtered estimate
element values at the output of the vector estimation
system from at least one of the elements of the sequence of
input vectors.

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19. An encoder for processing a speech signal as
claimed in claim 18, wherein an output of the adder module
is coupled to a rapidly evolving component encoder.

20 20. An encoder for processing a speech signal as
claimed in claim 17, wherein said parameter estimator is
characterised by said current predictor gain element values
being dependent upon both a sequence of previous input
vectors and a sequence of filtered estimate vectors.

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